SECOND

REPORT

OF THE

SELECT COMMITTEE

ON THE

ROADS

FROM LONDON TO HOLYHEAD,

AND

FROM CHESTER TO HOLYHEAD;

&c.

STEAM PACKETS.

Ordered, by The House of Commons, *to be Printed,*
2 *April* 1822.

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SECOND REPORT.

THE SELECT COMMITTEE appointed to inquire into the state of the Roads from *London* to *Holyhead*, and from *Chester* to *Holyhead*; into the regulations for conveying His Majesty's Mail between *London* and *Dublin*, and between the Northern Parts of *England* and *Dublin*, and between *Dublin* and the interior of *Ireland*; and into the state of the Mail Coach Roads in *Ireland*; and to report their Observations thereupon, together with the MINUTES of the EVIDENCE taken before them, from time to time, to the House;——HAVE, pursuant to the Order of the House, further examined the Matters to them referred, and have agreed to the following REPORT:

YOUR Committee have proceeded, in compliance with that part of the instructions of the House, which relates to the conveyance of His Majesty's Mails between *Holyhead* and *Howth*, to examine into the circumstances attending the establishing of Steam Packets at Holyhead in the course of last year. For this purpose two vessels, called the Royal Sovereign and Meteor, were built, by order of the Postmasters General, in the River Thames, on a plan to give to them the greatest possible strength, and the advantage of the most improved engines. The Evidence which has been given to Your Committee by a Commander of one of them, Captain Rogers, leaves no doubt of the practicability of performing the Post Office service at Holyhead by Steam Vessels, with as great safety as it can be performed by Sailing Vessels, even in the most tempestuous weather; and at the same time by voyages, on an average not exceeding one-half of the number of hours which formerly was the average of the voyages of the Sailing Packets. But Your Committee are not as yet prepared to enter into all the details of this important subject, their object in presenting this Report to the House, is merely to convey to the House an opinion they have come to, in consequence of the evidence of Mr. George Henry Freeling and of Captain Rogers, that the Postmasters General ought immediately to give orders for building a new Steam Packet, so that at least there should be three Packets on the Holyhead Station, before the commencement of the next winter, of that peculiar construction which has enabled the Sovereign and Meteor to go to sea throughout the whole of the last winter.

Your Committee strongly recommend the same general plan of construction should be adopted in building a new Packet, as that on which the Sovereign and Meteor were built; and also, that the Engine should be made by Messrs. Boulton and Watt. They also recommend that the suggestions of Captain Rogers should be attended to in all matters respecting the building of a new Packet, as those suggestions will come from a person who appears to Your Committee to possess great knowledge in seamanship and ship-building, and by the experience of commanding a steam vessel through a most tempestuous winter, to have made himself master of the best method of managing one at sea, and also of all the main properties of the mechanism of the engine.

Your Committee have annexed to this Report the evidence of Mr. George Henry Freeling, Captain Rogers, Mr. J. Brown, and Captain John Percy, and also certain Queries which they have sent to several persons who have had the most experience in constructing and navigating steam vessels. They intend to continue their inquiries upon this interesting subject, and hope to present to the House a full Report upon all its details before the close of the Session.

2d April 1822.

MINUTES OF EVIDENCE.

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Jovis, 21° die Martij, 1822.

SIR HENRY PARNELL, BARONET,

IN THE CHAIR.

George Henry Freeling, Esquire, called in; and Examined.

G. H. Freeling, Esq.
(21 March.)

THE Holyhead steam packets have been principally under your management?—They have.

Be so good as to state to the Committee, generally, the course of proceedings which have taken place for introducing the use of steam vessels upon the Holyhead station.—The Postmasters General have been obliged to purchase all the sailing packets, and to clear the station for the introduction of those vessels; the object was, at first, to make the steam auxiliary to the sailing packets, but we found that the steam packets could do even more than the sailing packets, consequently we keep two sailing vessels as auxiliary to the steam.

How many steam packets have you employed?—We have three altogether, exclusive of the Tartar.

Be good enough to name them and describe them.—The Royal Sovereign of 210 tons, and the Meteor of 190; the Sovereign is fitted with two engines of forty-horse power each, and the Meteor with two engines of thirty-horse power; they were both constructed by Boulton and Watt.

Where were the vessels built?—In the river Thames, by a person of the name of Evans, at Rotherhithe.

Were they built purposely of any particular strength?—They were built on purpose for the service, under the inspection of the officers of the Navy Board; they were built upon Sir Robert Sepping's principle of the diagonal fastening, and made particularly strong.

What is the third steam vessel?—The third is the Ivanhoe, which was formerly on the Holyhead station as a private vessel.

What is her tonnage?—165; the power of the engines fifty-six.

Is she as strongly constructed as the others?—No.

Was she used by the former proprietors for winter voyages?—She has been out in very bad weather, but has not been run the whole winter.

What has been the general effect of the experiment, in regard to maintaining a communication between the two countries?—The intercourse has been very much facilitated; it is now almost reduced to a certainty. In the year preceding the introduction of the steam vessels, a hundred mails exactly arrived in London after they were due, and in the nine months that the steam vessels have been running since May last, there have been twenty-two only.

Those nine months include the winter months?—Yes; when we have had much worse weather than the year preceding. The paper I have before me will more fully explain this.

G. H. Freeling, Esq.

(21 March.)

[*The witness delivered in the paper, which was read as follows :*]

" From the Return made to the Order of the Committee on Holyhead Roads, of the number of voyages performed by the Sovereign and Meteor, it appears, that in a period of 265 days to the 20th February last, they have made 205 passages only.

" The remaining 60 days may be thus accounted for ;—

The Talbot was on duty	16 days.
The Ivanhoe	6 —
The Tartar	8 —

" In 30 instances no steam packet left Holyhead, in 11 of these whilst the steam packets were under repair the mails were dispatched by sailing vessels, which effected the passage, in four instances, in time for the departure of the coaches from Dublin.

" In the other 19 instances, the weather prevented any vessel from putting to sea, or forced the steam packets back after having put out.

" Twenty-five mails have been brought from Ireland by sailing packets.

" The steam packets have been too late for the Liverpool mail in about 40 instances, and the London mail has been out of course in 22 cases only."

How was the weather this winter at Holyhead, as compared with other winters? —I understand that the weather, the beginning of the winter, was worse than has been known for more than sixty years. We have proof that the steam packets will go to sea in weather when sailing packets could not have gone to sea ; the captains have always considered that it would not be prudent to go to sea, if they were obliged to be under a three-reefed mainsail, and the steam packets have gone out in weather in which the sailing packets would have been obliged to be so.

Were they able in those cases to make their passages in a reasonable space of time ?—Yes; the longest passage, I think, was seventeen hours and twenty minutes.

Was that in a gale of wind, with the wind adverse ?—Yes, decidedly.

What was the shortest passage ?—Five hours and thirty minutes.

What is the average of the passages of the Sovereign from Howth to Holyhead? —Six hours and fifty-seven minutes, and the Meteor seven hours and four minutes and a fraction. To Howth, the Sovereign seven hours thirty-six minutes and a quarter, the Meteor eight hours and thirteen minutes : the shortest passage was from Howth, five hours and thirty minutes.

Do the steam packets sail at all times from Holyhead, notwithstanding a bad gale of wind ?—Sometimes the weather is so bad they cannot venture to put out.

By what regulation is the point determined, whether the packet shall go to sea or not ?—The captain reports to the agent, and if the agent is not satisfied, his instructions are to send out another captain in charge of the packet, if he will go ; if both refuse to go nothing of course can be done. There are three or four instances in which they have put out, and found they had not head-way, and of course it was better to come back than to attempt the passage.

Do they usually steer in the face of the wind ?—The best point for a steam vessel, in very bad weather, is directly head to wind ; both wheels can then act at the same time. The captains sometimes keep the vessel away, when it is blowing very strong, two or three points ; then, when they get on the opposite coast, they will take in their sails, and steam to the harbour in smoother water.

Do you not conceive that the success of those two vessels, the Sovereign and the Meteor, is very much attributed to the superior manner in which they were constructed ?—Decidedly.

Do you think any steam vessels, you are acquainted with, could have gone through the same difficulties that they successfully encountered ?—I have attempted to gain some information about every steam vessel which has been built, and I am convinced those vessels will do what no other vessel can do ; they will go to sea in weather when nothing else can. I attribute that not only to the machinery, but to the weight of the hull ; a lighter vessel in a heavy sea would be checked, but those vessels have from their weight a momentum so great, that it carries them on when a lighter vessel would have been checked ; the weight acts as a fly-wheel.

The

G. H. Freeling, Esq.

(21 March.)

The weight they have arises from the great quantity of timber and iron used in the construction?—They are filled in solid, and they are nothing but masses of wood and copper.

To what height are they built solid on the sides?—I cannot state that.

In speaking of the tonnage of those vessels, do you mean the tonnage of the vessel estimated according to the rules applicable to other vessels, or the cargo these steam vessels are capable of actually carrying?—On the rules applicable to common and ordinary vessels.

Those vessels are coppered and copper-fastened?—Yes.

Every thing has been done to render them as secure and strong as possible?—Certainly; I have the authority of Mr. Lang of the Navy Board for stating that, with the exception of the Discovery ships, there are no vessels so strong.

Is it your opinion that three packets are a sufficient number for maintaining the communication between Holyhead and Dublin, so that two shall sail every day?—Yes.

What is the arrangement with respect to allowing sufficient time for looking over the engines and keeping them in repair?—With the view that there might be a sufficient time allowed for looking over the machinery and the vessels, it was arranged that they should each be six days at sea and three days in harbour, which affords ample time for inspecting the machinery; that has been fixed in a great measure with reference to the engineers themselves, who stated that that time was more than sufficient for it.

Under whose care are the engines?—Under the charge of the engineers. When the packets were first established, as it was at so great a distance from London, we wanted men, not merely practical engineers, but having a greater portion of science than men of that description generally have, we were obliged to give very high wages, but we got certainly the two best men there were; we were obliged to buy them out of their situations in the River, one for each of those two vessels, the Meteor and the Sovereign. As the Ivanhoe might perhaps be merely a temporary vessel, we got the engineer who was with her from Liverpool, but of course we shall obtain the best engineer to be procured when a third packet is regularly established.

Each engineer has charge of his own engine?—Yes.

In what manner is the packet commanded?—There are four captains, who take it in turn; there being three vessels, each has charge of the vessel going the six days in turn, and once in a month the captains go off duty for eight days—the fourth allows a relief.

Is the engineer under the command of the captain?—Yes; certainly.

How many men are there on board each?—At present, as there are only two vessels, there are sixteen men on board each; as the work is very severe, there being only two vessels running every day, the complement for them, when a third is upon the station, is fifteen for the Sovereign, being the larger vessel, fourteen for the Meteor, and fourteen for the Ivanhoe.

What work do you allude to?—The going to sea every day, and clearing the boilers, and putting the vessels in proper order.

What time does that take after each voyage?—It takes a good while in the whole, as the boiler must be allowed to cool; the cold air must not be let in; it was found to crystallize the salt and injure the boilers, and we were obliged to cease doing that.

The seamen have not much spare time after a long voyage before the commencement of a fresh voyage?—In moderate weather they have.

There have been some accidents to the engines?—Yes, there have; but I hope that will be prevented in future; it was, I think, I may say almost entirely, to be attributed to the use of cast iron; the cross bars and the beams were of cast iron, and if any water was in the cylinder at starting, the check caused the cast iron to break; we have now got them made of wrought iron, but the lower beams of the engines, which are very large, are still of cast iron; there must be some part of the engine left to give way in case of any emergency, which is better than destroying the cylinder.

Have you altered those parts which were faulty?—Yes.

180. Since

G. H. Freeling, Esq.

(21 March.)

Since that there have been no accidents?—There has been one I think.

There was an accident in the summer with a beam?—Yes; they were of cast iron and hollow, since that we have got solid shafts of malleable iron.

Are the sails sufficient to navigate the vessels in case the engines fail?—Scarcely; there is sufficient to do it in case of emergency, but we have been trying experiments on the Dover station with different sorts of sails, and we find lug sails are more powerful than any others, and we have now sent down lug sails for the Holyhead packets instead of their fore and aft sails.

Is there any prospect of their being effectual to enable a packet to beat to windward?—A packet is so large a vessel it would not enable her perhaps to fetch to windward, but she would be able to reach some port, but there being two engines they can be disconnected, and one worked without the other; it has happened that a packet has proceeded using one engine only.

That is in case the main shaft does not break?—Yes.

You mentioned that the vessels were exposed to injury from Holyhead Harbour being so crowded, how has it been in the course of the last winter?—It has been frequently very much crowded; some time since two large brigs broke adrift in the harbour, and got foul of two of the steam packets; they did not do any very great injury.

It happens frequently in a gale of wind, that a great number of vessels come into harbour at Holyhead?—Yes, a very great number.

More than the size of the harbour is able on the sudden to accommodate?—Yes.

Have you any accommodation yet in the way of a graving dock?—No, I wish we had; it would be a very great object indeed for our service if there were to be a graving dock at Holyhead; at present they must go either to Liverpool or Milford; and Boulton and Watt, who furnish the machinery, are very anxious we should not go to Liverpool in case of accident, lest their competitors there should obtain possession of some of their machinery.

You have two sailing packets?—Yes; one stationed on each side.

Do they change?—They go across occasionally, once a week or a fortnight.

Are they commanded by a regular captain?—No, the mate is in charge; the mates who are selected for that are the most respectable men in the service.

What crew have they?—The sailing packet at Howth is fully manned; I think there are nine persons on board, including the mate.

Do they carry the mails?—Yes, when there is no steam packet; that at Holyhead has only four men as her regular complement, because we can always get enough people on a sudden to man her completely to go over.

Do they cross the Channel on any fixed days?—No; there are no fixed days.

Can any person hire a sailing packet that pleases?—It has never been made a question of; but it would be an object not to let them go lest an accident should happen to the steam packet expected next day; if there were three steam packets I conceive there might be no difficulty in allowing any person to hire one of them at Holyhead.

You have mentioned that there are only two steam packets at present that have been built particularly for the Holyhead service, the Meteor and the Sovereign, is it intended to build a third so as to make up your complement of three?—The Postmasters General have long had under consideration the building a third vessel, but when the Ivanhoe was purchased they wished to have a proof of what she could do before they began to build; they do not expect that the Ivanhoe will be found sufficient to run in the winter, and I believe measures have been taken for building a third vessel specially for the service, as far as regards obtaining plans and estimates.

Do you look forward to any improvements in constructing the new one?—I think the shape of the vessel can be improved to give her more velocity.

Which of the two is reckoned the best, the Sovereign or the Meteor?—It is hardly possible to draw a fair comparison, one of them having twenty-horse power more than the other; the bow of the Sovereign is infinitely superior to the bow of the Meteor, but the quarter of the Meteor is much better than the quarter of the Sovereign; if we could take the bow of the Sovereign and the quarter of the Meteor we should make a perfect vessel.

Has

G. H. Freeling, Esq.

(21 March.)

Has the experiment led you to expect that an eighty-horse power engine is preferable to a sixty?—I think the sixty-horse is preferable if the vessel is built a little finer with a foot less breadth; a good engine with a sixty-horse power would drive that vessel as fast as the Sovereign with her eighty.

What would be the effect with regard to heavy seas and bad weather?—She would be equally calculated for the bad weather. We find of the Sovereign and Meteor, the Sovereign is the best vessel going head to wind from her power; but in blowing weather, with canvas, the Meteor is certainly superior. When we were going round to Holyhead from the River, we had some very bad weather off Beachy Head, and while the Sovereign was labouring in a sea, both under canvas, the Meteor shot by us; I thought she would have been down upon our deck; almost when we got round the Lands End, the weather was so extremely bad that we had hardly head-way, and we thought we should have been driven up to Bristol, fortunately the wind moderated and we were able to get into Milford. We were so anxious to get round the vessels, that the Meteor left the River in a very incomplete state; we had shipped several people in the river Thames who were sick and useless, and when we came to the very worst there were only four people on board the Meteor who could stand on their legs; considering all circumstances this could scarcely be taken as a fair trial, but on the whole the Meteor did as well as the Sovereign.

Both vessels put into Milford?—Yes. The Postmasters General, I believe, have some idea of trying whether what are called Scotch engines may not be better for a third vessel, in case of one being built; they are more simple though perhaps not quite so efficient, not so liable to derangement, and are consequently better for a heavy sea; and if the vessel is properly built, I do not think there can be any great difference in the rate of speed.

Inform the Committee in what the principal difference consists between the Scotch engines and Mr. Watt's.—I am not able to answer that question.

Is there not a difference in the paddles?—Yes, there is a difference in the way of fastening the paddles; we have tried the principle of the Scotch wheel at Dover, with machinery of Boulton and Watt, but we do not find it makes any material difference.

Have any of the Scotch vessels gone through the winter?—I believe not; the Rob Roy has been running occasionally between Dover and Calais in the winter.

You have a post-office steam packet between Dover and Calais?—Yes, two.

Have they gone through the winter?—One of them has gone through the winter, the other has only lately gone round, but from their draught of water, and the difficulties of the harbour on each side, Calais and Dover being dry harbours, and their not being able to run into them at all times, the captains have not thought it prudent to go in such weather as the Holyhead packets have put to sea in.

Are they built on the same principles as the Holyhead?—The wheels of one are not upon the first motion; there are spur wheels, but we find that will not do for sea-way, the crank is so much more simple.

Has any thing been done to assist the packets at Holyhead to get into harbour in bad weather?—A gun has been sent to the South Stack, and each of the steam packets is supplied with one, that in foggy weather, if they do not exactly know where they are, they can fire and the man at the South Stack answers them.

Is there the same arrangement at Howth?—I believe not.

You have tried an experiment at Holyhead, with an engine upon an entirely new construction, in the Tartar packet?—We have.

What has been the result of that experiment?—I must first say that the inventor has not carried into effect every thing he intended, therefore the trial may be said to have been made while she was in an incomplete state. The Tartar, as an experiment for our Holyhead service, has entirely failed; indeed Mr. Broderip admits she is not calculated for the Holyhead station; his object was to make the machinery auxiliary to a sailing vessel, that she should have all the properties of sailing with the power of applying machinery if the wind was contrary.

Then the failure has been more owing to the attempt of connecting the sailing power with the steam than any failure in the principle of the engine?—The engine is faulty in part certainly.

What is the postage on a letter from London to Dublin?—Fifteen pence.

What part of that is for crossing the Channel between Holyhead and Howth?—Two pence.

G. H. Freeling, Esq.

(21 March)

What is the postage from London to Holyhead?—Thirteen pence.

Might not a vessel, constructed with all the properties of sailing, with the Sovereign's bow and the Meteor's quarter, have a steam engine put into her, and answer as well as the Meteor or the Sovereign?—Certainly, as far as the hull is concerned; the object is velocity through the water, whether the vessel be propelled by machinery or by canvas.

Are the boilers in those Holyhead packets high pressure or low pressure?—Low pressure. Mr. Watt, I believe, was the inventor of the original high pressure engine, but afterwards abandoned it on account of the danger.

No cases of late have happened of accident from the bursting of boilers?—Not that I am aware of.

The bursting of the boilers in either of those two packets would interfere with the action of the steam engine, but would not be attended with dangerous consequences to the crew?—The boiler would not burst, it would rend or open.

There could be no explosion?—No.

That arises from its being made of wrought iron?—Yes.

What precautions are taken to prevent accidents by fire on board the post-office steam packets?—There is a greater space; the engineers can get round the boilers and under them and over them; in addition to the outer case round the bottom of that part of the funnel which is near the deck there is a third iron flanch which comes from the funnel to the deck.

What number of boats is there in each packet?—There is only one on board at present.

It having been observed that the boat was on the deck, was that the proper place for her?—No; the proper place is hanging from the stern—there are davits for the purpose there.

Under whose care are the ladders at Holyhead from which the passengers embark or disembark from the packets?—I believe the commissioners of the pier.

How many feet at low water is it from the top of the pier to the deck of the packet?—Fifteen or sixteen feet, I think.

What description of ladder is made use of?—It is a very indifferent ladder; it is in my opinion scarcely safe.

Jovis, 28° die Martij, 1822.

George Henry Freeling, Esq. again called in; and further Examined.

G. H. Freeling, Esq.

(28 March)

ARE there any alterations or additions you wish to make in the evidence which you gave on a former day?—I wish to explain some parts of it as to the steam packets, in addition to the securities I mentioned against fire; we do not put any fuel or coals over the boiler, which was the cause of the Robert Bruce catching fire and being burnt. They used to stow their wood and fuel over the boiler, which became ignited in some way; it never is done with us, it is positively forbidden.

Where are they stowed?—In cases made for the purpose in the engine-room.

Are the cases lined with iron?—They are iron cases. The other point was as to the Ivanhoe. I was asked whether she was so strong as the other vessels; the answer was simply, "No." But she is not three years old; she was inspected at Liverpool a short time ago, and I think she is as strong as any of the steam vessels, except those on the Holyhead station.

Was any thing done to her to make her stronger?—She was inspected and made as strong as possible under our direction.

What timber is she built of?—Fir.

Then it is the difference arising from the different state of the two sorts of timber?—Yes; and the difference of her filling in; she is not filled in as the others are.

Besides that is there a difference in the timber?—Yes.

Do you look upon it that the superior strength of the oak counterbalances the weight?—I think the weight is a great advantage. A question was also asked as to the practice of begging for money. I have ascertained that there is certainly no instance of the packet seamen having done this at all. There are men who were formerly in the packet service who attend as porters on shore, and being out of employment follow passengers and ask them for money.

You

G H. Freeling, Esq.

(28 March.)

You do not now allude to the steward?—I now allude merely to the sailors.

Is there any code of regulations as affecting the passengers delivered from the post-office?—There is no written code of regulations.

What accommodation is there on board the Royal Sovereign as to births?—There are twenty altogether.

How many rooms are there?—Two; one for ladies and one for gentlemen.

How many births are there for ladies?—Six.

The cabin appropriated to gentlemen is fitted up with sofas?—There are two sofas.

Is there any rule or regulation which prevents ladies going into that cabin if they find it convenient?—None whatever; but we rather wish to keep the after-cabin distinct for ladies, because when they are in bed they do not wish strangers to be there, but we find it impossible to do that. Gentlemen going over with ladies say, "keep me out if you dare; my sister, daughter or wife is there, I will go in to take care of them."

Is there any regulation that if a lady was to wish for a pillow to support her in her carriage that she could not have it?—I have never understood so; there is a regulation that the stewards shall not bring the beds upon deck; we have had a great number of beds spoiled from being brought upon deck in bad weather.

Captain William Rogers, called in; and Examined.

Captain William Rogers.

You are the commander of one of the Holyhead packets?—I am.

Be so good as to acquaint the Committee in what manner the communication has been kept open between Holyhead and Dublin by the steam packets, and what has been the success of the experiment of establishing them on that station.—We have done every thing that could be done by steam boats, and they will go no doubt when a sailing vessel will not; that has been proved.

Have they fully answered the expectations you had formed of them?—Fully so; they have exceeded my expectations.

Have you had full trial of them with respect to gales of wind?—Yes, in every way; I crossed in the Meteor on the 5th of February, in the heaviest sea I have seen during the eight years I have been on the station.

Have the steam packets sailed regularly the whole winter?—Except a very few days; I have seen them go several times when the sailing packets could not.

What have you considered to be the sort of weather when you say the sailing packets could not go?—I went in the Meteor on the 5th of February, when no sailing packet could carry canvas, they must have laid to; I left at nine at night, and arrived at six the next morning.

Was it blowing in the way you describe at the time of your leaving Holyhead?—Yes.

The sailing packet would not have attempted, under the same circumstances, to have gone to sea?—No one could have gone.

How came you to sail at nine o'clock at night?—There were two mails on board; the Tartar put back with the mail, and I took her bags.

In what point was the wind?—South-west and by south; no sailing vessel would have got under weigh at the time; the Chichester sailing packet came over the same day from Howth, with a three-reefed mainsail, storm jib, and could not bear a foresail, and it blew harder when we started.

How long was the Chichester coming over?—About seven or eight hours.

Why did you go at nine at night?—To prove what steam would do.

The Tartar had put back, and you had taken the mail she could not take?—Yes.

Are you not perfectly satisfied, from the experience you have had, that the steam vessel you command is capable of performing what no sailing vessel can do?—Yes.

You mean the steam vessels built for the Holyhead station?—Yes.

Have you not often left Holyhead, during the winter, when no sailing vessel could get out?—We have.

Have you discovered that the steam vessels you command, built under the inspection of the Navy Board, are as safe as any vessel you ever navigated?—Certainly.

Is there any danger, in your opinion, to be apprehended from them as steam vessels?—No.

In

Captain William Rogers.

(28 March.)

In what way is your safety provided for in the shape of valves?—We have safety valves, but I cannot say how many pounds to the square inch.

If at any period the fire should elevate the steam to such a pitch, has not the engine the power of relieving itself?—It has.

Have you observed that, in crossing the Channel with an adverse wind, you accomplished your passage under easier circumstances than you could possibly do in a sailing vessel, inasmuch as you were enabled to go head to wind?—Yes, much easier.

Do you find that a steam vessel is capable of making her passage much sooner, under all circumstances, than a sailing vessel?—Yes, in one half of the time upon the average.

With the wind at W.N.W. blowing hard, and leaving Holyhead in a gale of wind, you have found a steam vessel has been much easier than a sailing vessel?—Yes, their extreme length overcomes the short sea.

Do you, with such wind, steer your course direct?—That depends on the weight of the sea and state of the tide. It is a general rule with me, when the vessel will steam from three knots to three and half, and the vessel not labouring much, to make a straight course; if otherwise, to sail her until I smoothen the water, then down all sail and steam right for the port.

Have you found in blowing weather that the vessel works at all either inside or out?—No, not at all; I do not see it in the least, not a single thing, she is as solid as a wall.

What do you attribute that principally to?—To the diagonal works, and to the mode of fastening.

Have you tried the coal tar?—Yes.

How long have you used it?—Ever since she has been built.

What is the longest time you have ever been on the passage?—Fifteen hours is the longest I have been.

Do you conceive that any improvement can be made in the construction of a steam boat should a new one be ordered?—Yes; I think we could make improvements.

State what they are.—I do not think too fine a vessel will do; when she is so very fine she will not answer in those seas; the bow of the Meteor is too full and the Sovereign's quarter is too heavy.

What improvement could you suggest to the Committee to do away that?—In building a steam boat she ought to have a fine entrance and her bow to flear off, not to shove any water before her; any water she shoves before her must be an impediment to the sailing; she should have a fine entrance, a good line of bearing, and her transome pretty square, and not too high; the more you can stop a vessel from pitching and rolling the quicker she will go; I found with regard to the Scotch boats that all their transomes were too high and too narrow, the consequence of which is, that with a head sea they go with their stern under; I have seen them go boat and every thing under; the transome being square and low and fine under, so as to give them a right line of bearing, will stop their pitching and rolling and make them easy on the sea and add to their speed.

You attended the building of these two vessels, the Meteor and the Sovereign, in the river?—Yes, I did.

Describe generally the cause of their great strength.—They are filled up solid to the floor-head, caulked inside and out, having no tree nails, but bolted and copper nailed. The bolts are driven upon a ring and clenched at both ends.

Have you Spanish heads?—Yes; then there is the diagonal fastening.

Describe what that is.—The diagonal fastening is a plank three inches thick fore and aft, three and a half thick midships, and nine wide leading from the floor-head to the shelf, taking in five or six timbers; and then it is filled by truss pieces into triangles, so that it is almost impossible that the form of the vessel can alter.

Have not these vessels proved themselves decidedly superior to any other steam vessels?—We have never seen any other steam vessels that would go with them; they are very superior to any others in strength, safety and speed.

Have you examined many steam vessels?—I have been on board several; the Majestic, the Superb, the Ivanhoe, and the Talbot, and many others in London river.

Have you sailed in any of them?—Yes, in the Superb and the Majestic from Greenock to Liverpool; Talbot and Ivanhoe from Howth to Holyhead.

Captain William Rogers.

(28 March.)

Did you go to Greenock for the purpose of inspecting the steam vessels?—Yes.

Did you see and examine those other vessels previous to the building of the two Holyhead packets?—Yes.

Have any other steam vessels navigated and kept at sea all the winter?—None. The Majestic and the Superb had some difficulty in making their passages last October, and were laid up for the winter. I remarked on board the Majestic when I was in her that she was very tender.

Very crank?—Yes, very crank.

If you were consulted with respect to building a new vessel, what other alterations would you propose besides those you have mentioned with regard to the bow and the stern?—Their main beams might be put closer to the wheel, and their boiler placed lower, and the engines nearer together and more in the centre.

The engines on board those vessels were made by Boulton and Watt?—Yes.

Have you seen the Scotch engines?—Yes, I have.

Are you able to inform the Committee which engine is best?—I should prefer Boulton and Watt's engine to any other; their boilers are very superior, and never short of steam. Boulton and Watt had been accustomed to vessels for rivers, and the engines were made rather too slight for our Channel; the shaft was hollow, and of cast iron, but they have been replaced by solid shafts.

Have those vessels ever been disabled except when they broke their shafts?—They have broken their cross-heads, which are soon replaced. I broke two, and they were replaced immediately; the cross-head of the piston, and the cross-head of the air-pump, which were replaced with wrought iron spare ones on board.

Were those replaced at sea?—Yes; we stopped one engine and worked the other with the wind right a-head, and in five hours the engine was repaired and worked. There is a difference of opinion between wrought iron cross-heads and cast iron; they say it is better for the cross-heads to break than any thing worse, which is the beams, or the top of the cylinder to be knocked off.

Then, in point of fact, since the month of May last, when these two vessels were put upon the Holyhead station, they have never been disabled, except in those two instances when the shafts broke?—No; and then they could have made their passage.

You are able always to keep one engine at work out of the two, unless the shaft fails?—Yes; you may always work one engine, unless the shaft breaks. The shaft is the only part common to both engines, and therefore unless the shaft is broken, the two engines are not disabled.

Comparing the Meteor and the Sovereign with any other steam boats you have seen, are they not infinitely superior both in construction and safety?—Yes; and in speed.

In a gale of wind?—Yes.

Have you ever exhausted your fuel?—Never half.

Do these engines consume much less fuel than the engines of other vessels you have been on board?—I should think less than half.

What is the rate of consumption by the hour?—We use about eight hundred weight in the Sovereign per hour; in the Talbot and Ivanhoe they each consume about fourteen hundred weight.

What does the Meteor consume?—About five hundred weight.

What are the respective powers of the Sovereign and the Meteor?—The Sovereign has two forties, and the Meteor two thirties.

Do you find the Sovereign a superior vessel in consequence of this increase of power?—Yes, in going head to wind; but there is a great deal owing to the Meteor's bows; she will not go head to wind.

Which vessel would you prefer in a gale of wind?—I think the Meteor is the best boat in a gale of wind.

Generally speaking, would you prefer an eighty to a sixty horse power in a gale of wind?—No; but I think the Sovereign is rather overpowered; if you were to put two forties in her again you must put in much heavier engines. The advantage the Sovereign has over the Meteor is going head to wind, but the Meteor will beat her with her canvas. The Sovereign's canvas steadies her and lightens the engine, but does not much help her speed.

Supposing you were choosing your own vessel, what plan would you prefer?—I think you might build the vessel a little smaller for two thirties; if we were to build for two forties we must build a larger vessel than the Sovereign, and she is full large for the station.

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Captain William Rogers.

(28 March.)

What size would be the best size for vessels for the station, and what power?—I think the Meteor is very near the size, with the improvements we could make upon her.

Under all the circumstances of your passages, have you not found the motion of the steam boat much easier than the sailing vessel?—Yes; it is not to be compared to it.

In a gale of wind have you found the passengers complain of the motion?—Yes, they do complain of the vibration; passengers frequently complain on board the steam packets that they were never sick before, but I do not pay much attention to that, for the last passage is always the worst.

In what degree are you able to take advantage of sails in bringing them to aid the steam power of the vessel?—Sails assist the vessel very much; we use them every way, except going head to wind, within four points of the wind.

Do you find them assist considerably in the speed of the vessel?—I have found the Sovereign go as fast in a calm as at any other time. It must not be thought that a steam boat running before the wind in a gale and a heavy sea, that she ought to make the quickest passage, as we are then obliged to shut off half the steam, or great part of it; for should you allow the full power to be on, the wheels running two or three times round without touching any thing between the trough of the sea, and then being brought up all at once, something will probably give way.

And by thus moderating the steam there is no fear?—No; the engine goes as easy as a glove.

Do the sails serve to steady the motion?—Yes; they steady her certainly.

Do you not make just as good a passage with a foul wind as a fair wind?—In a light air of wind we do not mind going head to wind, and smooth water.

Supposing the engines to be out of order when at sea, so as not to be able to use them, have you sails enough to enable you to command the vessel?—Yes. The other day when I hove the Meteor to I stopped the engine, and we were going three knots and a half with the lee wheel nearly under water; we were sounding; it was very heavy weather.

Have you the power of putting the wheels out of gear?—You may unconnect them from the engine and let them run round, or take your floats off; but we cannot do that when the engine is going.

When you broke your shaft what did you do?—I was not on board her then, but I towed her back; I met her about seven leagues from Howth, and towed her back to Holyhead.

How was the wind blowing?—South south-east, fair for Howth.

Do you think she could have got on with the sails?—Yes, and made her passage; but as the mail was sent away by a schooner to Howth, it was better to tow her back, as Holyhead was the only place to repair her.

A shaft has been broken twice?—Yes, twice; once in the other boat.

What was done in the other case?—She was towed back.

Supposing dark weather to come on, the wind blowing hard from the Irish shore, so that you could not have made the land, could you have laid to or sailed the vessel?—Yes, we could have sailed the vessel or have come to an anchor; by putting two cables together which she has on board, she would ride out any gale in the Channel as easy as a glove.

You are of opinion that in the event of the engine failing, with the assistance of sails and the anchor you may always keep the packet in perfect safety?—There is no doubt of it.

In the event of any accident happening to the steam apparatus with a lee shore, what power have you, by sails, of keeping off that lee shore?—I cannot see where there is a lee shore, it must be either over at Dublin or at Holyhead; and if it is a lee shore, then it is a fair wind back.

Have you ever been in such a situation, since you have commanded those packets on a lee shore, that you could not take the tide under your lee bow on one tack or the other?—Never.

Have these packets the same power to go to windward as a common merchant vessel?—Yes, and they will beat a common merchant vessel in sailing.

Have any improvements been made lately to give steam packets more power of canvas?—Yes, there have been.

Explain what they are.—Three more cloths are put in the mainsail; and a very large fore lug; the after one remains a schooner sail.

Will you be obliged to carry more ballast in consequence?—No, we are as stiff

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Captain William Rogers.
(28 March.)

as churches; we take out 12 tons of coal in the summer; there are 60 hours coal on board.

Upon the whole, with the nature of the Channel, the shores, and the power of the canvas you can put upon a steam packet, with the aid of anchors and cables, you feel perfectly secure at all times, though the engine may go out of order?—Yes.

Has it ever occurred to you to lay to for a night at anchor?—No, we never should lay to any where.

Have the packets ever been out a whole night, starting in the morning?—Never; one o'clock in the morning is the latest they have been out; you cannot lay to in a tides way, or ought not so to do; we do not want it; the people get more used to steam vessels now; we can hit the land at any time now, either the hill at Howth, or Holyhead light-house.

Have you guns on board for signals?—Yes, a six-pounder each.

There is a gun at the Stack?—Yes, there is.

Have you found it of any use as yet?—We have had no use for it as yet; we shall want it in the summer, I dare say; I have not the least doubt we shall find it of great service.

Is there any gun at Howth?—No; there are some on the round towers.

Not to assist the packets?—No.

From the superior construction of the Meteor, and the Sovereign having their timbers filled in and caulked, in the event of getting on shore and knocking the keel off, or the planks off the bottom, still the vessel might be saved?—Yes, certainly; there is a very great difference of opinion as to filling vessels in that way.

Have you found those two vessels equally buoyant with any other you have sailed in?—Yes.

Has the great weight of her timbers and materials diminished her power of speed?—No, I think it rather gives them speed against a sea.

Then the inconvenience anticipated from the mode of constructing these vessels has not taken place?—No, it has not.

Are the Committee to understand your opinion to be, that in any weather, however severe, the steam boats will stand that weather as well as any sail boat?—Yes, in any wind; the more wind the better for the steam boats; that is where they show their superiority.

In the heaviest gale that could blow you would rather be in a steam packet than in a sailing packet?—Yes; that is in a vessel of our own construction.

Sabbati, 30° *die Martij,* 1822.

Captain William Rogers again called in; and further Examined.

Captain William Rogers.
(30 March.)

BE so good as to give the Committee an account of your voyage from the River round to Holyhead.—On the 16th of May, blowing hard from the S.W. 3. P.M. I left Gravesend on board the Sovereign, in company with the Meteor steam packet, with seven or eight men on board of each. At 9 anchored in the Downs, blowing very hard; she rode very easy with thirty-five fathom cable in five fathoms water. On Thursday the 18th fresh gales from W.S.W. 5. A.M. weighed anchor and steamed for Portsmouth; wind dead on end. 4. P.M. made the Owers Light; hazy weather. 9. P.M. very heavy gales and thick weather. I asked the engineer what coals he had on board, he told me five hours; we were then obliged to steam in for the land. At 10 made the Nab Light upon the starboard quarter, about a quarter of a mile; shortened steam for the Meteor to come up. At eleven anchored at St. Helen's in six fathoms water, with forty fathom cable; hard gale. On the 19th, 3. 30. A.M. weighed anchor and ran into Portsmouth harbour; made fast to one of the buoys alongside His Majesty's ship the Queen Charlotte; then we were employed in getting coals in, and very bad they were. At 4. 20. got under weigh and steamed out of the harbour, and at 9 passed through the Needles against a flood tide. This day was fine weather, and light airs from the N.W. At 1. 30. P.M. anchored in Falmouth harbour; there we remained a week to clean the boilers, to caulk the decks, and so on. Sailed from Falmouth the 26th, wind N.W. fresh gales. At 5. 30. past the Longships Lights. At 9 in a squall, with heavy rain, the wind shifted to the N.N.E. blowing very heavy and a heavy sea, the vessels going from three knots to three and a half, head to wind, blowing hard. At 7 made Lundy Island, bearing E. by S. passed several vessels lying to; passed a large smack,

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(30 March.)

smack, lying to, under close reefed mainsail. At 8 made sail upon the vessel; stood more to the southward into the Bristol Channel, to smoothen the water. At noon more moderate; water smoother; down all sails and steamed for Milford. At 5 anchored in Milford, found several vessels had been out in the gale and obliged to put back; the vessels that had been put back, bound to Liverpool, said they had never experienced worse weather before for many years. On Sunday evening the wind more moderate, and from N. to N.E. At 8 P. M. got under weigh. On Monday, at 4 P. M. arrived at Holyhead.

How. many days were you performing this voyage?—Five days, with the wind right a-head down the English Channel and up the Irish.

During that period could any square rigged vessel, from a first-rate down to a sloop of war, have performed the voyage you did in the time you did in the steam boat?—No; it was impossible. In the Downs we passed several Indiamen, and 150 sail there that could not move down Channel, and at the back of Dungeness we passed 120 more.

During that period how did your vessel behave herself, under the circumstances of bad weather and adverse winds?—Nothing could be better, but she rolled a little, and which I think we can cure her of.

What improvement could you suggest to prevent her rolling?—I should take a foot off her beam in the first place, and make her bottom not quite so round, and the engines placed nearer together, and her wheels not quite so wide on the side; they are eight feet wide.

In a gale of wind on a lee shore, do you not think them much safer vessels than any square rigged vessels?—Yes, most certainly; because they can use their steam as well as their sails.

Be so good as to describe to the Committee the exact improvement you would recommend as to the construction of a new steam vessel.—I should make her a foot narrower, and raise her floor-heads a little, take off the roundings, with her engines put nearer the centre, the boilers much lower, and the wheels narrower: I have observed in our vessels with these wide wheels, the lee wheel is a great deal under the water, and the other out; by the width of them it increases the angle; and although a wide wheel is of great advantage in a river, I think it is a great disadvantage in a sea; supposing there were two forty-horse power engines, I would not have more than a seven-feet wheel; ours is an eight-feet wheel, and if there were two thirty-horse power, six and a half, in my opinion, would be sufficient.

Would those wheels have power to give the packets the same speed they have at present?—Yes; we might lose twenty minutes in a calm, but we should gain two or three hours in a gale of wind; that has been tried in this river by the James Watt; her paddles are nine feet wide, and with one half of them on, four and a half in length, she was found to go nearly nine knots, and she only goes ten with the whole on; but I must observe, that after you get a vessel to go nine knots, it takes a great addition of power to make her go the tenth.

As to the form and shape of the Meteor and Sovereign, what improvement would you recommend in a new vessel?—I should recommend it to be a little finer and eighteen inches narrower than the Sovereign, and a foot narrower than the Meteor.

What alteration would you propose with regard to the bows?—Much finer than either of them.

Have you sufficient experience of the Scotch engines as to be able to give a decided opinion in favour of the engines made by Mr. Watt?—No, I have not yet. I have been in the Scotch vessels several times, and I have seen their steam go down; in one of them the vessel was nearly on shore; it was the Majestic; she was entering the narrow passage going into Liverpool, and they let the steam go down; she was nearly on shore in consequence; unless you are constantly firing you can never keep the steam up.

Has that ever happened on board the Holyhead packets?—No; never.

On building a new vessel, would you recommend Watt's engine to be made use of?—Yes, I would, for my own part.

Can you suggest any improvements?—I should make the engine much stronger.

In what respect?—In every part.

What effects have you observed, when on board the Scotch vessels, from the engines?—I have seen fire going up the chimney, and I have seen sparks of fire flying over the deck; there must be a great waste of fuel in consequence; we never

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Captain William Rogers.

(30 March.)

see that on board our vessels; they come out dearer, but they are cheaper in the end.

At the time you performed that voyage, with the weather you have described, from the Downs to Milford, if that weather had continued twelve months, would any square rigged vessel have performed it?—They would have been a long time about it, probably would have been weeks instead of days; a sailing vessel would not have beat up to Milford as we did in twelve months.

What parts of the engine give way most frequently?—The cross-heads at the top of the piston. If the engineer is not very careful, and allows them to get too hot, you may carry away a cross-head, or if water is allowed to get in the piston, which it does sometimes, being too hot. I think there will be an improvement in that before long.

What time ought to be allowed, in your opinion, for looking over a steam engine in order to keep the vessel as much at sea as circumstances will admit of?—Two or three days. An engine should never lie by longer, because if she was to lie by in the harbour, you would have to set the engine going to keep it in order.

Does it require three days to give an engine a complete looking over?—No; two days, or a day, or two or three hours; it is according to what is to be done to her.

What number of days may a vessel sail, day after day, without a thorough examination?—They might run a week, fortnight or longer, but once a week it would be necessary to examine them.

You recommend she should lie by two or three days, and be examined?—Yes.

Then, on the Holyhead station, it being necessary to send a packet to sea every morning from Holyhead, and another from Howth, in order that the vessels may be kept in order, how many vessels, in your opinion, should be maintained to do the service?—I think you might do it with three, and very easy, with a sailing vessel on the other side; then a vessel would be lying by three days and running six.

With those arrangements of lying by three days and being at sea six, three vessels would just exactly perform the service, and no more?—No more would be required; they would perform the service; nor is it necessary they should lie by three days.

Supposing they sailed six days and laid by three, there would be no day on which they were not at sea or lying by for the necessary time for examination and repairs?—It does not follow that they would want repairs.

Supposing they do lie by three days and are at sea six, it occupies the whole time, there is no spare time?—The spare time would be the three days.

If each packet is at sea six days, and if she lies by after every six days for three days, she would actually upon no occasion lie by more than three days, if allowed to her?—Certainly not, unless there is any thing particular to do to them.

Three packets would just perform the service, and nothing more?—Yes.

But upon a press a vessel would go eight days instead of six?—Yes, we have gone all the winter and summer with two.

Since the Meteor and Sovereign have been at Holyhead, have they not been continually at sea?—Yes.

How many men are there on board?—Fifteen.

What work have the men to do after the packet arrives at either side?—They get the coals in, and clean her.

What time does that take?—About a couple of hours with horses and carriages.

Have you not made many voyages in succession in gales of wind?—Yes, many.

Coming in late after a gale of wind, and having to sail early in the morning, do not the men go through a great deal of hardship while the weather continues bad?—Yes, but they have their night's rest; if a man be in a sailing vessel, and should be on deck two or three nights, he would soon find the difference to a steam vessel.

Do you not think the work is as hard on board the steam packets as the sailing packets?—Certainly not, as regards myself.

As to the men?—Nor as to the men; if a man complains of a steam boat, he must be afraid, or something of that kind. I never read a novel before I was on board a steam packet, and I go down now frequently and read for an hour or two; if a man works hard in the day, he has his night's rest, and a man is never better than when he does his day's work; I have not the anxiety now which I used to have, being up night after night.

Captain William Rogers.

(30 March.)

In what way is it decided whether a packet shall go to sea in case of very bad weather?—By the commander and the agent.

What is considered to be weather to keep a steam packet from going to sea?—There may be a difference of opinion upon that; when it is a downright hurricane, and it is impossible for any vessel to stem ahead, we do not attempt it.

Do they go out when the cutters cannot?—Yes, with the wind at N.N.W. which is the very worst wind we have.

Do you go out when a sailing vessel would not?—We have made many passages when a sailing packet would not go out.

Were there many gales from the N.W. last winter?—Yes, several.

Has it been a worse winter than usual?—I have heard it said, that it has been the worst winter for fifty years. Lloyd's have paid more this winter than ever they did.

Have the gales been from the S.W.?—Yes, S.W. and W.S.W. and that generally finishes with a N.W. wind.

Have you had many from the eastward?—No, only one gale.

Which do you reckon the worst gale?—I think meeting with an easterly gale is the worst; there is always a heavy sea upon the shore, the gale does not last so long, but leaves a very disagreeable short sea. Many times after an easterly gale, we have been two days beating over in a sailing packet, which a steam vessel will perform in eight or nine hours.

Have you ever sailed in a heavy easterly gale from Howth in a steam packet?—No, I have not; the Meteor, Captain Davies, entered Howth harbour with a very heavy gale from the eastward, when the Marquis Wellesley went over, and she went in very easy. It was the heaviest sea that had been seen for many years.

Has the harbour at Holyhead been crowded very much with vessels?—Very much; I have seen 120 or 130 vessels there.

Have you experienced much difficulty in getting in or out with the packets?—No; but the Sovereign has suffered some damage with vessels driving upon her.

Is the harbour large enough for the number of vessels that have recourse to it in bad weather?—No, I do not think it is.

Is it not the practice frequently for the Liverpool vessels to run in?—Yes, but when Dunleary is finished, I am of opinion that will be the out port of that Channel. There have been several instances of vessels leaving Holyhead, and have gone there to wait for a wind, which have made their passage out of the Channel whilst the vessels at Holyhead have still been wind-bound

Have you found any difficulty in bad weather in getting the packets into Howth harbour?—Never.

Have they ever touched ground there?—Very seldom. They are deepening it in the west pier.

Have any of the vessels been damaged by touching?—No; the sailing vessels used to be.

Are there any inconveniences in landing passengers and carriages at the pier at Holyhead?—Not passengers, but carriages. I have seen Sir Colin Campbell's carriage detained on board the Sovereign for twelve hours for want of a crane being in the proper place.

Where is the crane?—Half the pier up one of them is, and the other is down in the jetty.

Where would you propose to put the crane?—About 120 feet from the jetty. There are no fenders, and we run a very great risk of breaking the wheels or destroying the engine, for want of them; no longer back than last Sunday, we nearly met with a very serious accident, by striking the foundation stones at low water; I did hear before Mr. Rennie died, there were orders given for them, but have not heard a word about them since.

Are the cranes in a proper situation at Howth?—Yes; they have got two, and a third, a temporary one.

Where are they placed?—One on the west jetty, one abreast of the Custom-house, and one on the east pier.

Are there fenders at Howth?—There is every thing complete there.

Would not an extension of the harbour at Holyhead, so as to admit the Liverpool traders to come in, be of considerable value and importance?—O! yes.

Have the East and West Indiamen, any port to run into between Milford and Liverpool?—No, Holyhead might be made one.

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Captain William Rogers

(30 March.)

In case of an accident in the Channel, where must they go to repair?—Liverpool.

Is there a sufficient depth of water for forming a pier at Holyhead, so as to make it a harbour for the general trade?—Yes; between the point of the salt island and the present pier, there is a large rock, which would be a good place to run a pier from, with plenty of water to take any vessel.

And such a pier would give perfect protection to the largest vessels that come in?—Yes.

How long would such a pier be?—Half the length of the other.

In what manner are horses put on board?—Either by boxes or slings.

Is there a box always at hand?—Yes, one on each side.

What sort of accommodation is there on board for horses in the steam vessels?—The fore-hold will contain six horses.

What floor is there?—It is a wooden floor and it is battened; a horse would find his feet better upon ballast, but you cannot put ballast there, for if a horse was to kick some of the stones into the engine, it would spoil the engine.

How many sailing packets are kept in addition to the steam boats?—Two.

Do they sail every week?—No, they are changed monthly; there is the Chichester and the Pelham.

Supposing the sailing packets were to sail one from each side on particular days might not this give a better accommodation for the carriage of horses?—No; nor will people go in them.

Is the Ivanhoe built sufficiently strong to stand the winter season at Holyhead?—She is not so strong as ours, but she is as strong as other vessels in general.

Is she strong enough to go through the regular service of the station at Holyhead?—While she is new she is; she would not run long.

Is she made of fir or oak?—Fir.

What precautions have been taken on board the Meteor and Sovereign to prevent accidents from fire in the arrangement of the furnaces and boilers?—There is water all round them, and they are kept three feet from the bottom, about fifteen inches from the side, and twelve inches from the deck; we are differently constructed from others, and it is quite impossible that any accident can happen, there is water under and on the sides of the fire places; in those boats that are fitted up upon the Clyde there is nothing but brick and mortar below the furnaces, we have iron.

Martis, 2° *die Aprilis,* 1822.

Captain William Rogers again called in; and further Examined.

Captain William Rogers.

(2 April.)

IN the event of building a new steam packet, what improvements would you suggest in respect to the build, the engine, the sails, and to the interior arrangement of her?—I think I should build her in the same manner as the others are built, on Sir Robert Sepping's plan as to mode of fastening, diagonal fastening, &c. &c. only a little finer at each end, and one foot narrower than the Sovereign and Meteor, to be 95 feet in the keel, 105 or 106 upon deck, and 19 feet in the beam, about 180 tons, her transomes square, and not very high out of the water. The improvements in the engine would be to make them a little stronger, and the boilers a little longer, keeping them more from the side of the vessel, so that the heat might not affect her, and more room to go round them, and to put the boilers lower down.

What advantage would you get by putting them lower?—It would help to prevent their rolling. The Talbot's boilers are a little higher than the Ivanhoe; by putting the Ivanhoe's lower down, found she did not roll near as much. I would have the two main beams put close to the wheel, which will reduce the weight very much and strengthen and make the vessel much easier, as by being so far asunder adds great weight, and acts as a lever. There should be twelve paddles about seven feet long and nineteen to twenty-one inches wide. The engine should be something between sixty and eighty horse power, but this must depend upon the fineness of the vessel, and the water she will draw. If the engine is to be made much stronger, in that case we must not go further than two thirty horse power engines, as then the weight might be too much. I should recommend, with regard to the sails, a large lug forward, and

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(2 April.)

and a jib and a fore and aft mainsail; and in case any thing should happen to the engine, I would keep a square topsail on board, and a gaff topsail aft, but not to be used except in case of necessity.

You would also be able to set top-masts?—Yes.

Mr. James Brown called in; and Examined.

Mr. James Brown.

You belong to the house of Boulton and Watt?—I have been agent for them some years.

Did you put up the engines on board the Meteor and Sovereign steam packets?—I superintended their erection.

What parts of the engines most frequently fail?—We generally consider the working parts, the cross bars, the side rods, and the side beams.

To what do you attribute the cross bars having broken on board these vessels?—In some instances from want of caution on the part of the engineer, and in other cases from stress of weather.

Were they made of cast iron or malleable iron?—Hitherto of cast iron; they are now made of wrought iron for sea vessels.

Have you put engines into any other vessels?—We have put engines into most of the vessels on the river Thames, the Dover station and Leith.

Have accidents happened frequently to those vessels?—Upon the Leith station one or two cross bars have broken, and that was entirely from want of caution on the part of the engineer in starting the engine; the other vessels were the Dasher and Arrow on the Dover station; there was one accident of a cross bar breaking in the Dasher.

Was that from want of caution?—I cannot say that.

Have accidents happened to vessels in the river?—In the first instance there were three or four little breakages, but subsequently they have gone on very well.

Has any other part of the engines of the Holyhead packets failed?—A shaft was broken, I think the crank shaft.

Was it made of cast iron?—Yes; and I believe its failure was attributed to there having been some screws drilled into the shaft to fasten on the risings for eccentric circles, it was considered that these wounded the shaft, as it broke up that part.

Have the side beams failed?—They are called side beams or main levers.

Have any of them failed?—Only one in the Meteor.

Is that made of cast metal?—Yes.

What would be the effect of making the whole engine as strong as possible, by using nothing but malleable iron?—I do not conceive you could make an engine without being liable to break; there are some parts so small that they must give way, and it is better the most insignificant parts should fail, than some of the principal ones, because they are easier repaired.

Is an engine liable to that extraordinary pressure upon it, under particular circumstances, that it is better to have some part that would yield?—I should think so; for instance, it would be better for the cross bar to break than the side beam, and if not either of those two, that some of the cutters or straps of the side rod should go.

You mean that it would be more easy to repair?—Yes; but if the engine-man sees any thing going wrong he has only to let off the steam.

Can those repairs be made at sea?—Not well; but there are generally duplicates on board of those parts liable to accident. You could not well straighten the bent parts of wrought iron at sea.

In case of constructing a new engine for a Holyhead packet, can you suggest any improvements?—Merely in respect to making the materials stronger and heavier. I conceive the construction of the engine is almost incapable of improvement as it now is.

Would you make any alteration in the arrangement of the boilers?—It would be better to lower the whole machinery together, bring the engines nearer the centre of the vessel, and let the boiler rest upon the keelson.

Would you require more room than was granted in the Sovereign and Meteor?—Yes; it would be better we should get round the boilers entirely, they could then be painted every month, which would be a great advantage, for the action of the salt water is very detrimental to the iron; they ought to be painted every three weeks, or or every month; where a boiler will not leak with fresh water it will with salt water; and it forms incrustation upon the surface by exposure to the atmosphere; they should be pumped out, and frequently cleaned.

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How long would it take to paint a boiler?—Half-a-day.

What number of voyages may an engine go, supposing the distance to be each voyage twenty leagues, without looking over and making a thorough examination of it?—I should think the engineer generally looks over his engine every morning before he starts to see that every part is properly oiled, and that every screw and joint is tight. If so inspected, once a fortnight would be sufficient to examine the packings of the slides and pistons.

Supposing the vessel to finish her voyage late in the evening, and go to sea again early in the morning, would it not be necessary to lay her by occasionally to examine her?—I think it would be an advantage to the service to have a spare vessel to perform the duty while repairs were being done to the others, and overhauling the machinery.

Would it not contribute to the preservation of the machinery to have that overhauling take place at particular periods after a certain number of voyages?—Certainly.

What time would it take to overhaul an engine completely, to ascertain whether she was in any respect injured?—If there were no repairs to do I should think two days would overhaul all the packings about it, even doing it leisurely; if exertion was required it might be done in half the time.

Would you make the paddles for a new engine different from those put to the Holyhead packets?—We should make them the same as for the Leith vessels, they are made with wooden floats in one piece, having three sets of arms, and the bolts are of a peculiar description, which allows the paddles to slip from the outer end of the arm towards the centre of the shaft, by which means a vessel may use her sails the same as any other vessel; should any thing give way, there would be nothing but the arms in the water.

What time would it take to get rid of the paddles?—There would be only four or five to get rid of; the four topmost paddles would be slackened, and fall towards the centre of each wheel, the wheels would then be turned round, and the bare arms would be in the water.

How would you steady the wheels to enable the men to work upon the paddles?—By lashing the wheels fore and aft with tackles.

Have you not some contrivance for engines at work on shore, so that if they become exposed to any sudden violence, they stop themselves?—Pumping engines have.

Have you been able to apply the same principle to engines on board vessels?—I do not conceive that could be well done so as to act of itself, the engine-man should take the steam off, and disengage the eccentric, when he sees any accident likely to occur.

Is it not for want of some such precaution that many of the accidents have happened?—Perhaps in some cases it may be so, but I should apprehend it depended more upon the engineer than any thing else, he should never quit the engine room.

What circumstance is it that chiefly occasions that sort of excessive violence which contributes to injure and break the engine?—Any of the working parts getting loose, any of the screws getting between the finer parts, or the water getting upon the top of the piston in starting the engine.

In what way can the water get upon the top of the piston?—It is from the condensed steam that forms from the boilers after the passage is over, it gets through the steam pipe to the cylinder and condenses there, perhaps to the depth of 18 inches on the top of the piston, and if the engine is started suddenly without it being cleared away, it has not time to get through the thoroughfares.

What is the consequence of that?—The consequence is, that it is jammed between the top of the piston and the under side of the cylinder cover, and risks the breakage of some part; as water will not compress, something must give way, and the weaker parts of course will go first.

Is the City of Edinburgh steam vessel employed to go from London to Leith?—She went there during last season.

For what months?—I think on the 24th of June I first went down with her.

When did she stop?—I cannot say positively, I think the beginning or middle of October.

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Was she exposed to many gales of wind?—Her first passage was extremely rough, we were eighty-four hours making the passage.

What is the shortest time she made the passage in?—I think fifty-eight hours.

What is the distance?—We reckon it 450 miles, and I believe that is near it.

Do you take enough coal with you?—Yes, they have a sufficient supply in the coal boxes, and for a third of the passage more.

Why did she not continue to go through the winter?—I suppose she would not have paid, she is a large vessel of 400 tons.

Was she strong enough?—She was built at Blackwall yard, and that is quite enough to say she was sufficiently strong; the floor timbers were about 12 inches square.

What was her tonnage?—401 tons, the length upon deck 143 feet, and 14 feet depth in the hold.

Is she of a similar construction to the Holyhead packets?—She has not the diagonal timbers; she is built the same as other merchant vessels.

What precautions have been taken in the arrangement of the furnaces on board the Holyhead packets, to prevent accidents from fire?—I hardly think it is possible that fire can take place without great negligence, because the furnaces are completely surrounded with five inches of water round every part, and it is only in raking out the fire, and neglecting to water it, that any accident can take place; it is raked out upon an iron floor.

No rolling of the vessel could throw the fire about?—No; she must be pitching to a great degree, if that was to take place.

How are the coals carried?—They are in boxes in front of the boilers, so as to be right and left for the fireman.

Are those boxes cased with iron?—They are made of iron entirely.

Can a body of water be let in from above, in case of an accident by fire from neglect?—No; but there is a hand pump in the engine room to be used when they are filling the boilers, and they can get water enough from that; in the new Leith packets we have put jet pipes, the same as fire engines have.

Could you put these jet pipes on board the Holyhead packets?—Nothing could be easier.

What are the precautions taken to prevent accidents from boilers bursting?—I can hardly conceive on board these vessels, where condensing engines are used, that it is possible that such a thing could take place, they are generally provided with two safety valves, and the steam used is about from two and a half to three pounds pressure upon a square inch, at which pressure it blows off by the safety valve of its own accord.

How are those safety valves arranged, so as to be at all times operative?—Boulton and Watt have made them for many years in the way they now are, inaccessible for any person to load them by putting additional weight upon them; I have seen the Scotch engine men, in starting their engines, place their feet upon the safety valve.

Suppose by any accident the safety valve was out of order, and the pressure became too great for the strength of the boiler, and it was to give way, what would be the effect on the boiler?—Supposing such a thing, which I conceive is impossible, that the safety valves should get choked, the steam would come off at the feed pipes.

It would not give way under any circumstance?—No, not even though the valves were choked, the pressure is so extremely small; the boilers are calculated to sustain fifty times the pressure required of them.

If any part of the boiler, by length of use, became very thin, and gave way, would it fly or rend?—Merely rend, if malleable iron.

Were not the accidents that happened from boilers, sometime ago, owing to their being made on the high pressure principle, and being made of cast iron?—Yes, they were.

When made of cast iron, and the pressure too high, they gave way, and the metal flew?—Yes, just like a shell.

Malleable iron tears and rends?—Yes.

Without flying and doing injury?—Yes.

Have Boulton and Watt made any improvement in their engine since the Holyhead packets were built last year?—Not that I am aware of, the principle remains the same as it was when it left the late Mr. Watt's hands; the construction of the

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engines has not varied since the Meteor and Sovereign were built; they have made them stronger and added malleable iron in parts where cast was used.

Those were the first vessels that had engines for the sea from Boulton and Watt?—Yes, they were, and they are the first vessels that ever ran all the winter.

What quantity of fuel do they consume upon any given voyage?—I think the experiments made in the river with the Meteor showed that she consumed about seven bushels per hour, rather under, she was then working above her full speed; the Sovereign I think was from nine and a quarter to nine and a half; the Meteor has two thirty horse engines, and the Sovereign two forty horse engines; the latter when using that quantity of coal was going about nine miles and three quarters through the water per hour.

What time does this give for each ton of coal for the Meteor?—A bushel of good Newcastle coals is reckoned equal to a hundred weight of Scotch coal; so that it comes to very nearly the same thing; the Scotch coal generally burns very free and so does the Staffordshire, but the bushel of Newcastle coal is equal to a hundred weight of either.

Do you know the proportions of the Whitehaven coal to the Newcastle or Staffordshire?—No, I have no certain knowledge whereby I could speak of it.

What is the ordinary weight of the bushel of Newcastle coals?—The standard bushel should weigh eighty-eight pounds; the best Walls End, I have found them eighty; and the Wylam, seventy-seven; I found that by actual weight the specific gravity of the Wylam coal is much under that of the Walls End, the latter is not good for working engines.

What description of coals is the best for those engines?—The best coal we have been able to meet with is the Halbeath or Inverkeithing, from a place in Fife called Inverkeithing.

What is the peculiar quality of them?—Burning free and becoming a complete white ash without caking upon the fire bars.

Is it necessary to have a coal that ignites very quick?—Yes, if it does not cake afterwards. It is a great object to get good coals. In the first passage that I went with the City of Edinburgh from London to Leith, the coals were very indifferent and we were obliged to clear the fire every four hours.

Did you take the fires out?—Yes, took them out one by one completely; in coming back we had a description of coal called Halbeath Main, and with them went sixteen hours without cleaning the grates; the sulphur in coals will destroy the fire bars in a short time.

Do you find any inconvenience from salt forming in the boilers?—Yes, when the main hole cover is taken off and they are exposed to the atmosphere, the water then becomes crystalized and renders them very difficult to clean.

Has this been avoided by any plan?—Yes, by constructing pumps or cocks to let the water through the side of the ship without the main hole being opened.

Does that prevent the crystalization?—Yes, quite.

Has the salt water much effect upon the boilers?—It oxidates the iron very rapidly indeed, if it is allowed to lie upon it.

What period will a boiler last, supposing it constantly in use?—On board a steam vessel, I should think from four to five years with care; it is the only part of the machinery subject to decay.

These engines, upon the whole, require a considerable degree of care and superintendence, and skilful engineers?—They certainly do require more care than the land engines; every engine requires great care.

Captain John Percy called in; and Examined.

Captain John Percy.

You command a steam packet on the river?—Yes, from London to Margate; the Hero.

Have you commanded any other vessel?—Yes, the Victory, belonging to the same company; I commanded the Victory for three years; the Hero was built last year.

Do you go through a good deal of sea occasionally?—Yes, off the Margate sands, when it is blowing from the northward and eastward on the top of the tide, she being such a large vessel, feels it more.

What is the tonnage of the Hero?—427 tons.

What is the power of her engine?—Two engines of fifty-horse power.

Who are the engines made by?—Murray and Fenton, of Leeds.

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Where was the vessel built?—At Rochester.

What months in the year have you been running these vessels?—We begin about the latter end of April and run into October, about the middle of October; I have run into November in one year, the 14th of November.

What engines had you on board the Victory?—Two twenty-fives.

By whom made?—Mr. Dickson, of Holland-street, Blackfriars.

Are you acquainted with Boulton and Watt's engines?—We have not any one in our concern; I am acquainted with vessels that run with them, and I rather think they are the best; they have not had so many accidents as we have.

What sort of accidents do you allude to?—First, the cross-heads in the Hero went away twice in the last season, and several of the bolts and the steam pipe went; now we have got copper ones in the room of cast iron.

From your experience in conducting those vessels, can you suggest any improvement that can be made in them, in respect of the engine or the vessel?—In respect of the vessel, we should improve if we had but half the projection work; in consequence of their being such an immense hang over, it jars so, enough to shake the vessel to pieces.

In respect of the engine, can you suggest any improvement?—Not as to the engine; as to the boilers, we never find ours last more than two years.

What part gives way first?—The bottom.

What quantity of coal does the Hero consume an hour?—Pretty well three quarters of a chaldron or twenty-seven bushels, London measure, per hour; in general, they make away with six chaldron in the passage, that is owing to the want of flues; we have not flues enough; we have four furnaces; it is owing to an error in our burners, that we burn so many coals.

What is the distance from London to Margate?—About eighty-four miles.

At what rate do you commonly go?—We generally make the passage in about seven hours and a half, that is the average passage; one passage I made in six hours and sixteen minutes, with the wind and tide.

What sails do you carry?—Very handsome lugs, fore and main lug and jib, and a square sail when it will admit of it.

You have two masts?—Yes; we used to work them with mizens, but we found they carried so much weather helm, that they did more harm than good; most of our vessels want head sail, and not aft sail.

When in heavy seas, do you find the engines work well?—They jar a good deal when they pitch.

How wide are your paddles?—Eight feet in the centre.

How many paddles have you on a wheel?—We have been trying an experiment last Saturday with twelve, and it answered very well; last summer we worked with sixteen paddles, three and a half feet between each.

Have you ever used paddles wider than eight feet, in any vessel you have been aboard?—No; I believe the Hero is the widest of any vessel running; the paddle of the Victory was five and a half in one place; the Hero worked more with the paddles being further apart, and we lowered them a little.

How much have you lowered them?—The Hero was the fastest vessel on the river; we raised them seven and a half inches, and then we were the slowest; now we have raised them four inches, and that will be about the thing.

What made you raise them?—They thought the vessel would go faster and easier.

How much do they take of the water?—About seventeen or eighteen inches.

What does your engine work up to?—Thirty strokes per minute she did on Saturday.

What is the lowest?—Twenty-two; she once did up to thirty-one, but twenty-nine and thirty is about the go.

What is the diameter of your wheels?—Fourteen feet.

Have you ever commanded a steam vessel at sea?—I have been across to Calais when His Majesty went over.

How did she perform her voyage?—Pretty well going, it was fine weather; but she worked very much coming back, it was owing to the width hanging over; she jarred so much, you would have thought the top was coming from the bottom; if it was not for that, she would be the fastest vessel in the water.

How many feet water does she draw?—Six feet four. I have not a doubt had the hang over been taken off we should have done very well. The vessel I have to contend with draws only four feet eight; in smooth water she will do very well, but in

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(2 April.)

in sea-way she will not do, she rolls very much from want of depth of water to check her.

Where do you carry your coals?—Close to the fire, in two iron tanks, that hold six chaldron and a half; there is a little clap-hatch at the bottom where they keep working down; we carry two stokers.

What precautions have been used to prevent accidents from fire?—There is a set of buckets on board.

What is there under the furnaces between them and the ship's timbers?—Iron plates.

Is there nothing under the iron plates?—No, that is before the furnace mouth.

What is under the bed of the furnace?—Large, stout, heavy iron plates.

Is there no brickwork?—No, none; the greatest danger is in raking the rubbish out after the passage, and not cooling the ashes. She burns such an amazing quantity of coal, and that makes the heat the more, and damage has been done to the timbers from that.

Does your vessel go out every day?—No, there is a day between each passage, one in town and one at Margate, to examine and clean the vessel. We sail from London on the Saturday and come away from Margate on the Monday, and go down on the Wednesday.

You have a day's holiday between each passage?—Yes.

Do you find that time necessary to keep the vessel in order?—Yes; we find all the time taken up; the men are never still.

How many hours, on an average, does your passage require?—About seven and a half.

How many miles an hour does that make?—Between eleven and twelve.